Chapter IV

THE INTRACOASTAL WATERWAY: ATLANTIC SECTION

The tidal streams, bays, and sounds that lie along and just within the shoreline of much of the Atlantic coast were indispensable arteries of communication and commerce for early settlers in America. Not many years passed before they began to speak of linking the waterways together with canals at one place or another to extend their usefulness. . Such enterprises were too formidable for seventeenth-century resources and knowledge, but by the final decades of the eighteenth century men were devoting themselves seriously to the idea, and at last in 1793 and 1796 attempts were made to link Albemarle Sound with "Chesapeake Bay and the Delaware River with New York Bay.[1]

In 1804 construction also began on the canal between Chesapeake Bay and Delaware Bay of which men had dreamed since at least 1654. A year-and-a-half later work came to a halt when the Chesapeake and Delaware Canal Company ran out of funds. Appealing unsuccessfully to the states of Maryland, Delaware, and Pennsylvania for financial assistance, the canal company then turned to Congress. Claiming that the canal was of national importance, the company's directors argued that it would free the coastal trade from the dangers of the sea, shorten water communications between Philadelphia and Baltimore by 319 miles, promote interstate commerce, lower freight and insurance rates, and facilitate the military defense of the country. Although Congress was not inspired to act immediately, the company's memorial sparked the Senate discussion of federal aid to internal improvements that led to the noted report of 1808 by Secretary of the Treasury Albert Gallatin on the transportation needs of the country.

The United States possessed, Gallatin noted, an inland navigation extending from Massachusetts to the southern extremity of Georgia (then the southernmost Atlantic seaboard state) that was '*principally, if not solely," interrupted by four necks of land: Cape Cod, New Jersey between the Raritan and Delaware rivers, the peninsula between the Delaware River and Chesapeake Bay, and the marshy tract between Chesapeake Bay and Albemarle Sound. With canals cut through them, the Secretary explained, a sea vessel could travel by rivers, bays, and sounds from Boston to Beaufort and Swansboro in North Carolina. From there a route through Stumpy and Toomers sounds and two cuts overland of less than three miles would extend the inland navigation with diminished draft to the Cape Fear River. Broken then by a short ocean run, the inland navigation continued again inside the chain of islands skirting the coasts of South Carolina and Georgia.[3]

Gallatin estimated that the cost of the four canals would be $3 million. His entire scheme for roads and canals would run to $20 million. By setting aside $2 million a year from the annual Treasury surplus, then in excess of $5 million, the whole undertaking could be accomplished in ten years. Gallatin's plan, delayed by foreign problems and then frustrated by domestic obstructions, was never fully implemented. His concept of an intracoastal waterway never died, but the waterway came into being through local projects rather than comprehensive planning. And instead of being completed in ten years, its construction took more than a century.

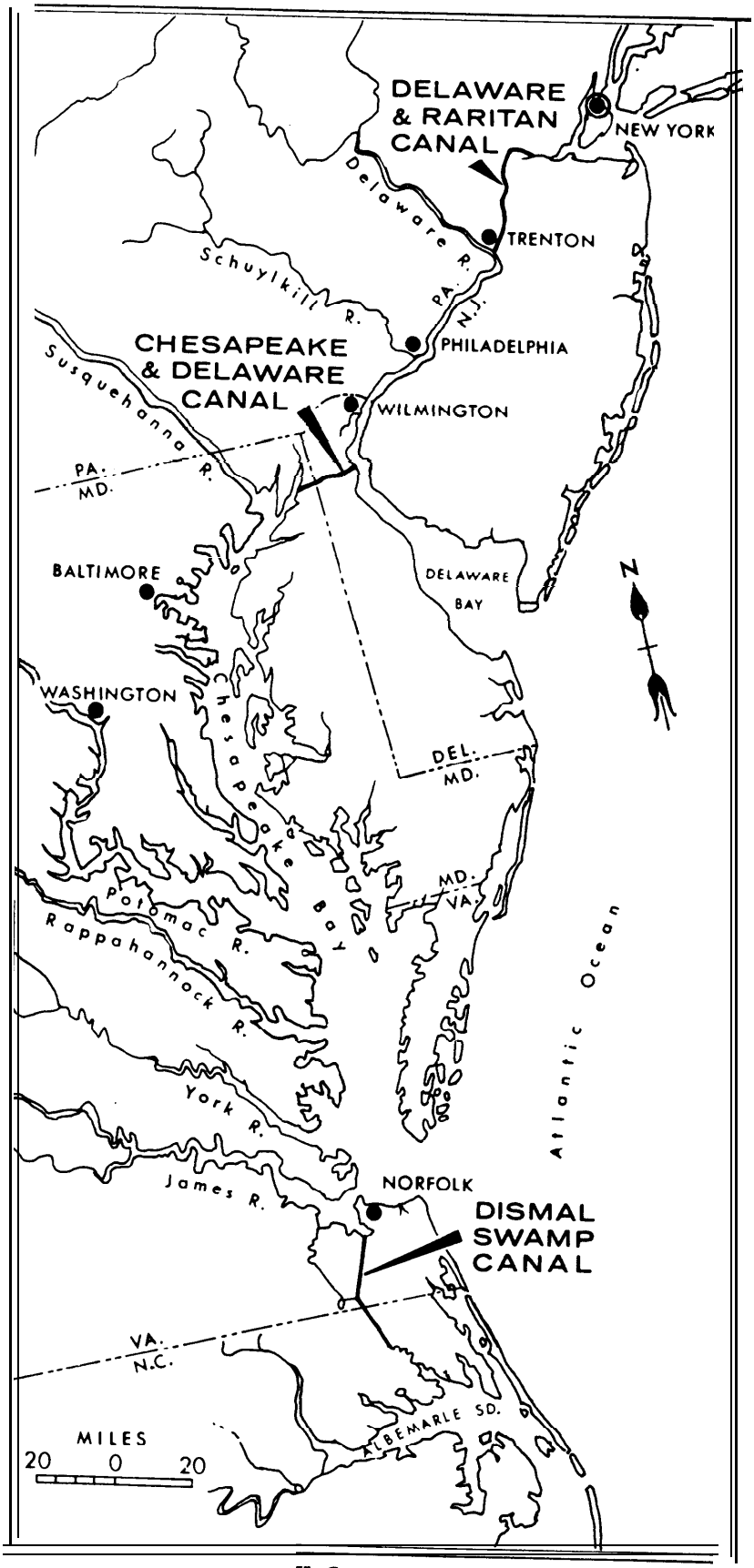
THE CONSTRUCTION OF THE CENTRAL CANAL LINKS

The Chesapeake and Delaware Canal

Until 1822 the Chesapeake and Delaware Canal Company did little else than make more futile appeals to Congress for assistance. Reorganized in that year by capable men, it obtained new stock subscriptions not only from private investors but from the hitherto reluctant states of Pennsylvania, Maryland, and Delaware. Before resuming construction the company had to settle an issue that had arisen over the best route for the canal, and it was on this matter that the federal government first lent a helping hand. An “upper” route, which had been selected in 1804, ran from the Elk River tributary of Chesapeake Bay toward Christian, then was to continue either directly to the Delaware River at New Castle or follow the Christina River to the Delaware at Wilmington. A recently proposed “lower’* route, more direct but more costly to construct, ran from the Back Creek branch of the Elk River into Broad Creek, through the ridge of the Delmarva Peninsula to St. Georges Creek, then on the Delaware at Newbold’s Landing, later renamed Delaware City. Upon the request of the company, Secretary of War Calhoun sent Brigadier General Simon Bernard and Lieutenant Colonel Joseph G. Totten of the Board of Engineers for fortifications to assist in making the decision. After examining the routes and reviewing all plans, estimates, and engineering data, the two Army Engineers conferred with two civil engineers in Philadelphia in January 1824. The unanimous decision of the board was for the lower route. Construction of the canal began the following April.

Continuing all the while to petition Congress for financial assistance, the company finally succeeded in March 1825, when President Monroe signed a bill authorizing a subscription of $300,000 for 1,500 shares of stock. Before construction was finished, unexpected costs in deep-cut and marshland areas forced the company to borrow $1 million and again appeal to Congress. An appropriation for $150,000 for 750 more shares of stock was quickly approved and became law in March 1829. Thus after

The Central Canal Links



U.S. Army Corps of Engineers

standing aloof for nearly 20 years, the federal government contributed $450,000 toward the canal's construction and, as the holder of nearly 38 percent of its stock, became the largest single proprietor.

Officially opened on 17 October 1829, the Chesapeake and Delaware Canal was 13.6 miles long, 10 feet deep, 66 feet wide at the top, and 36 feet wide at the bottom. Each of its four locks measured 100 by 22 feet. Although beset for a decade by crippling legal difficulties and costly engineering problems from which it never fully recovered, and almost immediately rivaled by a parallel railroad completed in 1831, the canal was by 1840 attracting increasing amounts of traffic and fulfilling its promoters' vision of becoming a major carrier of the nation's waterborne commerce.[4]

The Dismal Swamp Canal

The Dismal Swamp Canal connecting Chesapeake Bay with Albemarle Sound also owed its completion in large part to federal assistance. The construction of the canal, which extends from Deep Creek, a tributary of the South Branch of the Elizabeth River flowing to Norfolk, to the Pasquotank River draining into Albemarle Sound, began in 1793. Because of the Dismal Swamp Canal Company's inexperience, inefficiency, and constant lack of funds, work was still in progress when war broke out with Britain in 1812 and the canal was of little use in circumventing the British coastal blockade. Although the company stepped up its efforts to complete the waterway, when Major James Kearney examined the route in 1816 in response to an inquiry by a congressional committee, he reported that at the foot of the intermediate locks of the canal, '*if it may so be denominated," there had never been more than 18 or 20 inches of water. He thought that enlarging the canal was an absolute necessity for the country, but unfortunately the canal company was restricted by the difficulty of obtaining funds. The committee reported out a bill to buy stock in the company, but the measure fell by the wayside. Left on its own, the company could make only limited improvements.[5]

Federal interest in the Dismal Swamp Canal revived with the passage of the General Survey Act of 1824. In December 1825 in response to a query from the House of Representatives, General Bernard categorized the canal as "one link of the contemplated inland navigation . . . destined to connect . . . all our main streams emptying into the Atlantic." With larger dimensions, he advised, the canal would not only be of great military value but would "continue to a prompt, safe, and regular interchange of the manufactured produce of the North, with the raw materials of the South." A second report from the Engineer Department in

March 1826 stressed the military advantages of making the canal practicable for sloop navigation. Two months later, on 18 May 1826, Congress voted to buy 600 shares of Dismal Swamp Canal Company stock for $150,000, provided that the Board of Engineers determined that the improved canal would serve "as part of the chain of canals contemplated along the Atlantic Coast," and that the sum subscribed would be sufficient to complete the work.[6]

A survey carried out in July under the direction of Lieutenant Colonel Charles Gratiot, the Engineer in charge of defenses at Hampton Roads, produced plans to meet these conditions, and the canal company, fortified with the federal subscription and with loans totaling $137,000 from the state of Virginia, went to work. Reconstruction progressed so rapidly that by December 1828 an essentially new canal opened to traffic. Costs had evidently exceeded estimates, for in March 1829 Congress subscribed an additional $50,000 for 200 more shares in the waterway,[7] bringing its holdings in the company's stock to more than 40 percent.

The new canal was 22.5 miles long, averaged 40 feet wide, and could accommodate vessels drawing 5.5 feet of water. The elimination of two of seven locks made possible a speedier passage. A viable waterway at last, the canal rapidly attracted traffic. By 1833 the annual value of produce shipped through was nearly $2.5 million and by 1854 it was more than $3.5 million. Contrary to the prediction of General Bernard, however, trade was mostly local in character, coming from the sounds and rivers of North Carolina largely in schooners built especially for this traffic. Vessels occasionally sailed on to Richmond, Baltimore, or Washington, but most craft stopped at Norfolk.[8]

The Delaware and Raritan Canal

The Delaware and Raritan Canal, reaching 44 miles across central New Jersey from Bordentown on the Delaware River to New Brunswick on the Raritan, was the next link in Gallatin's chain to be constructed. Although the Army Engineers rated it, among canals being built or proposed in the 1820s, as first in importance for the defense of the country and third in importance for internal commerce,[9] the Delaware and Raritan received no federal engineering or financial assistance.

The idea for a Delaware and Raritan connection dated back to the seventeenth century, when William Penn and his associates are reputed to have commissioned an investigation of the possibility. In 1796 and again in 1804 short-lived attempts were made to connect the rivers, mainly by deepening existing streams rather than by digging a new channel. In 1816, with the lesson of the British blockade fresh in mind, the state of New Jersey

appointed a commission to explore the idea anew. Rejecting the earlier plan for a slackwater navigation as impracticable, the commission recommended the construction of a canal that in conformity with Gallatin's report would be large enough for seagoing vessels drawing eight feet of water.

During the next decade-and-a-half more than a dozen attempts to get construction of the canal under way by the state, by private enterprise, or by a mixed corporation were frustrated by inability to raise the necessary capital, local jealousies, or conflicting economic interests. Finally, in February 1830, the New Jersey legislature broke a deadlock between canal supporters and partisans of a Camden and Amboy railroad, who wanted to run a line roughly parallel to the canal, by chartering separate companies, one to construct the canal and the other the railroad. A year later the two companies united for their mutual benefit, and in return for guaranteed annual payments to the state, the legislature granted a monopoly of New York to Philadelphia rail transportation across New Jersey to the Joint Companies, as they came to be called.[10]

Opened in the spring of 1834, though not actually connected with the Delaware River at Bordentown until 1838, the Delaware and Raritan Carol was a large and well-constructed waterway. It measured 80 feet wide at the surface and had a depth of 7 to 8 feet. Its 14 locks were each 220 feet long, and the smallest was 24 feet wide. A navigable feeder canal 22 miles long, 60 feet wide, and 6 feet deep joining the main canal at Trenton brought an ample supply of water from higher up the Delaware. The canal quickly became one of the largest freight carriers in the country, with Pennsylvania coal dominating its tonnage.

The Inland Waterway Versus Sea Routes

With three links of Gallatin's projected intracoastal waterway completed by the late 1830s, a small vessel could travel from New London, Connecticut, at the eastern end of Long Island Sound, all the way to the large sounds of North Carolina without ever being exposed to the open sea. Long-distance shipments by this inside passage, however, were not often made. It was generally quicker and cheaper to make long transports by sea. Naval stores, red oak for ships, staves, shingles, and other forms of lumber from North Carolina, and flour and tobacco and other products from the Chesapeake region continued for the most part to reach New York and New England by coastwise vessels, while manufacturers from the northern states and from Europe furnished valuable return cargoes. Some long-distance shipments did come through the canals, particularly the two northern cuts. Barges filled with coal at Richmond, Virginia, arrived at New York via the inland waterway, while limited amounts of

merchandise moved back to Chesapeake ports the same way. And from far up the Susquehanna, barges descended to the Chesapeake and took the inside passage to New York, a journey of about 700 miles. But it was over the shorter distances, between the Carolina sounds and Norfolk, between Baltimore and Philadelphia, and between Philadelphia and New York, that the inland waterway carried the most traffic. On these transits it so successfully challenged the sea routes that only the bulkiest freight was left for coastal vessels.[12]

The Albemarle and Chesapeake Canal

At the southern end of this string of canals another potential waterway route existed between Norfolk and Albemarle Sound. Roughly paralleling the Dismal Swamp Canal on the east, it ran through low and level ground between Currituck Sound, an arm of Albemarle Sound, and the Elizabeth River. Requiring only short excavations, this route had such evident advantages that proposals for a canal had been presented to the Virginia Assembly as early as 1772. In 1807 Virginia and North Carolina granted charters to an aspiring canal company, but apparently because the Dismal Swamp Canal was already under construction, no stock was subscribed for the venture. Following the War of 1812 Major Kearney examined the route on the same assignment as his inspection of the Dismal Swamp Canal. With the interest of the government in mind, he concluded that the expense of improving the existing canal would be trifling compared to the cost of building a new one. Interest in the route persisted, however, and over the next decades several surveys were made by state and local agencies. Finally in 1856 the Albemarle and Chesapeake Canal Company began construction.

Designed for vessels of greater tonnage than the Dismal Swamp Canal could handle, the new canal was 8 feet deep, about 60 feet wide at the surface, and 40 feet wide at the bottom. Starting in the upper reach of the North River, a tributary of Albemarle Sound a few miles east of the Pasquotank River, it passed by a five-mile land cut through the Currituck Peninsula at Coinjock into the upper part of the Currituck Sound, thence by Currituck Sound and North Landing River to North Landing, Virginia, from where an excavation of nine miles brought it to the South Branch of the Elizabeth River at Great Bridge, five miles above the entrance to the Dismal Swamp Canal. Unlike earlier canals cut through more rugged terrain with primitive equipment, the Albemarle and Chesapeake was scooped through marshy soil by steam dredges working from deep water at both ends of the cuts. No lift locks were required, but because the Elizabeth River is a tidal stream, the company constructed a guard lock 220 feet long and 40 feet wide at Great Bridge to prevent currents from eroding the canal's banks.

In January 1859 the first vessel passed through the canal, a 75-ton schooner-rigged barge towed by a company side-wheel steamer. A steady stream of traffic followed. During the Civil War, when Union armies commandeered the canal, nearly 9,000 vessels made the transit. After the war, traffic continued to increase as the new waterway took over practically all of the trade passing between Albemarle Sound and Norfolk.[13]

THE UNITED STATES BUYS CANALS

Except for the now eclipsed Dismal Swamp Canal, the canals comprising the partially realized intracoastal waterway enjoyed increasing trade until about 1870. Forced from the outset, however, to meet competition from railroads, their financial returns were never sufficient to allow the expensive modifications necessary to keep pace with transportation requirements and, except for the enlarging of locks, their dimensions were not materially increased. After 1870, owing to the rapid improvement of railroad beds and locomotives and the lack of improvement of the canals, trade on the canals steadily declined. The traffic of the Chesapeake and Delaware Canal, which reached a maximum of 1.3 million tons in 1872, fell to 639,543 tons in 1890. In the same time span, traffic on the Delaware and Raritan Canal fell from 2.8 million to 623,751 tons. Without hope of revival through independent action, the canal companies turned to the federal government for relief.[14]

The Chesapeake and Delaware Canal

After 1871 the financial position of the Chesapeake and Delaware Canal Company steadily worsened. Growing competition from railroads and steamships using the outside route gradually forced tolls down more than 50 percent. Despite efforts to attract trade by giving larger rebates to towing companies, the important coal trade, which usually amounted to 40 to 50 percent of all traffic, declined by more than one-half between 1872 and 1879.

Adding to the troubles of the company was a movement, which took form at a National Commercial Convention in Baltimore in 1871, for the construction of a sea-level ship canal between the Chesapeake and Delaware bays. The supporters of this movement were not interested in an intracoastal waterway but in providing Baltimore with more direct access to the Atlantic in order to compete with New York as a great entrepot of overseas trade connecting with the West. In their view the Chesapeake and Delaware Canal, even if converted to a sea-level passage, was too far north to furnish the desired short outlet to the ocean. Looking primarily to the United States for the construction of the canal, its advocates succeeded in bringing about surveys by

the Corps of Engineers, between 1878 and 1883, of six probable routes across the Delmarva Peninsula. Upon submitting its findings to Congress, the Corps suggested the appointment of a special commission representing military, naval, and commercial interests to decide which route would best promote the defense and commerce of the country.[15]

When eventually appointed in 1894, the commission, chaired by Chief of Engineers Brigadier General Thomas L. Casey, rejected all of the surveyed routes and instead recommended development of the existing Chesapeake and Delaware Canal. Discounting the benefit of a ship canal to Baltimore's trans-Atlantic trade, the commission explained that for foreign traffic the gain in time from using any of the routes would be so small compared with the duration of the entire voyage it was unlikely vessels would risk the delays common in restricted channels. Thus a ship canal constructed on any of the routes would be used largely for interior navigation, and for this, the commission decided, the line of the present canal was the most advantageous. Though the Casey Commission report was unpopular in Baltimore, it was welcomed by the Chesapeake and Delaware Canal Company, which had already decided to do everything in its power to have its properties taken over by the government.[16]

Before Congress acted on the matter again, renewed interest in waterways began to be expressed in the nation. Despite the precipitous decline in canal traffic, belief in the relative cheapness of water transportation, especially for low-value bulk freight, remained strong. The competition of waterways was also seen as an effective means of regulating railroad rates. The most compelling cause for the renewed interest, however, was that the entire transportation system threatened to break down. Railroads, successful beyond their capabilities, had become clogged with more freight than their cars could carry and more traffic than their terminals could handle. Dozens of local and regional waterway associations sprang up for the purpose of pressing upon Congress the importance of waterway development.[17]

In 1906 Congress authorized a new special commission to determine the cost and advantage of converting the Chesapeake and Delaware Canal to a ship canal. By this time the advocates of a ship canal had significantly changed their tune. No longer urging a direct route to the ocean for Baltimore's foreign trade, they had for several years been touting the strategic and commercial benefits of the existing canal route as part of a great inland waterway. Reporting in January 1907, the commission, chaired by Felix Agnus of Baltimore, one of the first and most articulate of the ship canal advocates, declared that the canal was “the most important link in the proposed waterway from the Gulf to the City of Philadelphia . . . and its purchase and

improvement by the Government would be a benefit of extraordinary value." Bills to this end introduced in 1907 and 1909, however, failed to pass. Although the demand for the ship canal was growing, it still lacked sufficient strength.[18]

Adding to the political clout of the canal's supporters at this time, however, was the organization in 1907 at Philadelphia of the Atlantic Deeper Waterways Association. Its president was J. Hampton Moore, a congressman from Philadelphia, and chief among its other leaders was John H. Small, a congressman from North Carolina. The association persistently agitated for the systematic and gradual construction of a continuous inland water route from Boston to Key West. Because of the importance of the Chesapeake and Delaware Canal to its overall plan; "substantially the vital link," Moore maintained, the group became the canal's leading advocate.

In 1908 Congressmen Moore and Small introduced resolutions calling for surveys for an inland waterway from Boston to Beaufort, North Carolina, and from Beaufort to Key West. Approved in 1909, the surveys were the first to be made along the entire Atlantic coast. In 1910 Congress empowered the Secretary of War to negotiate the purchase of either the Albemarle and Chesapeake Canal or the Dismal Swamp Canal as part of the inland waterway if recommended in the survey report. The report on the Boston to Beaufort survey, submitted to Congress early in 1912, recommended two first steps in the development of the waterway: the construction of a 12-foot-deep waterway between Norfolk and Beaufort by way of the Albemarle and Chesapeake Canal and the purchase and gradual conversion, so as to interfere as little as possible with existing traffic, of the Chesapeake and Delaware Canal into a ship canal 25 feet deep. In the Rivers and Harbors Act of 1912 Congress accepted the first recommendation but not the second. According to Moore, "the desire to keep down the total appropriations and the pressure from the Mississippi Valley were too strong to be overcome."[20]

For several years repeated attempts to purchase the Chesapeake and Delaware Carol were frustrated by opposition from the West and Midwest, government economizing on waterway projects followed the outbreak of war in Europe, and failure to set a price acceptable to both the canal company and Congress. Finally, in 1917 Congress authorized condemnation proceedings. In March 1919 it made the necessary appropriation, and the next month the Wilmington District Court made a condemnation award of $2.5 million. This figure, which the company had agreed to accept prior to the award, had been set by the Agnus Commission as the value of the canal. It represented solely the bonded indebtedness of the company. As no dividends had been declared on the canal's stock since 1876, the commission had deemed it worthless. Formal transfer of the canal to the government occurred on 13 August 1919.[21]

By 1927 the first step recommended by the Corps--the conversion of the locked canal into a sea-level canal 12 feet deep and 90 feet wide at the bottom--was completed. To provide more ready access to deep water and to eliminate a sharp curve in the canal line, the Corps located a new eastern terminus at Reedy Point, two miles south of the old entrance at Delaware city. Reconstruction had proceeded with a minimum of hindrance to traffic, which increased while work was in progress from 481,000 tons in 1920 to more than 700,000 tons in 1928. Continuing to grow, tonnage exceeded one million tons in 1932 and remained well above the figure throughout the decade. New larger vessels were soon regularly navigating the canal, shallow-draft seagoing vessels occasionally used it, and in 1931 a new commodity—oil--began to pass through in tankers designed to the largest dimensions possible for use on the route.[22]

In 1935 Congress authorized the enlargement of the canal to 27 feet deep and 250 feet wide at bottom through the land cut and 400 feet wide down the Elk River and into Chesapeake Bay to deep water. Initiated with funds from the Emergency Relief Appropriation Act of 1935, the project was completed by 1938. Commerce through the canal increased dramatically from just over 1 million tons in 1935 to 3.8 million tons in 1940. World War II drove more freight to the protected passage, and in 1942, when German submarine activity along the Atlantic coast was at its peak, 10.8 million tons went through.[23]

Traffic on the canal dipped back to about 3.7 million tons by 1945, and then steadily increased until by the mid-1950s it amounted to nearly 10 million tons annually. In 1954 Congress again modified the canal project to provide for a channel 35 feet deep and 450 feet wide throughout, the reduction of curves in the channel, and the replacement of all movable-span bridges with high-level fixed structures (later changed to allow a vertical-lift railroad bridge). For several years meager funds allotted to the project permitted only minor works. But after new calculation of the project's cost-benefit ratio in 1932, which showed 30 percent greater benefits than costs, Congress provided for large-scale construction. Moving ahead at a steady pace, the project was by 1970 about 87 percent completed. Since then only minor work has been carried out. In 1979 vessels carrying 14.4 million tons of freight made 11,207 trips through the canal.[24]

The Dismal Swamp and Albemarle and Chesapeake Canals

The Dismal Swamp Canal, dealt a blow by competition from the Albemarle and Chesapeake Canal, was dealt another by the Civil War. Taken over to transport supplies first by Confederate troops and then by Union forces, neither of whom paid tolls or

provided maintenance, the canal deteriorated badly. In 1866 the canal company, reminding Congress that the United States still owned 800 of 1,944 shares in the waterway, asked for $200,000 for repairs. Congress responded by authorizing the Secretary of the Treasury to sell the stock, apparently intending that the company use the proceeds in lieu of an appropriation. At the same time Congress stipulated that the canal should be kept open as a navigable highway without any further expense to the government. This move died when the Attorney General advised that perpetual navigability of the canal was a matter the government could not control beyond its voice as a stockholder in the company and could not be insured by any guarantee a purchaser might be asked to give. 25 In 1867 the company floated a $200,000 bond issue, but the sum proved insufficient to rebuild a viable waterway. The company again petitioned Congress for aid in 1871 and 1874 without success. In 1878, in default on bond payments, it was forced by the bondholders to sell its properties, at which time the United States ceased to be a stockholder .[26]

Faring no better under new management, the company continued to lead a hand-to-mouth existence while the condition of the canal steadily worsened until only vessels whose draft did not exceed 2 feet had a reasonable chance of getting through without grounding. In 1892 came a turning point. The Lake Drummond Canal and Water Company of Baltimore purchased the canal and between 1896 and 1899 reconstructed it into substantially its present form. The new owners enlarged the canal to 10 feet deep, 60 feet wide at the surface, and 40 feet wide at the bottom; lowered the summit level so that only a single lock was required at each entrance; and dredged the canal approaches 10 feet deep and 40 feet wide. The Corps of Engineers, under a project authorized in 1899, widened the approaches to 100 feet.

The success of the reconstructed waterway in recapturing trade from its rival was remarkable. In 1880 the Dismal Swamp Canal had carried only 6,731 tons of freight, while the Albemarle and Chesapeake had carried 400,000 tons. In 1899, although reconstruction was not completed until August, it carried 78,211 tons compared to the Albemarle and Chesapeake's 316,793 tons. By 1906 the Dismal Swamp’s tonnage had increased to 340 135 tons, while its rival’s had dropped to 95,629 tons.[28] This advantage, however, was short lived.

The Corps of Engineers report on the survey of the intracoastal waterway from Boston to Beaufort, North Carolina, submitted to Congress in 1912, recommended the route of the Albemarle and Chesapeake Canal for the construction of the 12-foot-deep, sea-level waterway from Norfolk to Beaufort. The shorter land cut and lower elevation of this route brought

construction cost to less than half that of the Dismal Swamp route. Congress approved the project, and on 30 April 1913 the United States purchased the Albemarle and Chesapeake Canal for $500,000.29

The construction of the waterway, known officially as the "Inland Waterway from Norfolk, Vs., to Beaufort Inlet, N.C.," was completed in 1932. Congress modified the project in 1917 and 1918 to permit changes in the route and in 1930 to provide for the construction of a new tidal guard lock, measuring 600 feet long and 75 feet wide, at the Elizabeth River entrance to the Albemarle and Chesapeake Canal. Covering a distance of nearly 198 miles from Norfolk to Beaufort, the waterway varies in bottom width from 90 feet in land cuts to 300 feet in open waters. Upon leaving Albemarle Sound, it avoids broad Pamlico Sound and follows a succession of rivers, creeks, bays, and land cuts from the Alligator River, which flows into Albemarle Sound, to the Newport River, which leads to Beaufort Inlet. Prior to the adoption of the project the Corps had improved some of these water courses and, beginning in 1837, had made seven previous surveys for a through route. Now at last it had constructed a through waterway suitable for barge traffic as part of the larger scheme for an intracoastal waterway. Between 1970 and 1979 commerce on the waterway passing through the Albemarle and Chesapeake Canal averaged 1.36 million tons annually.[30]

Following federal purchase of the Chesapeake and Albemarle Canal, the Dismal Swamp Canal again lost trade to its now toll-free rival. For some years lumber shipped from landings on the canal's banks almost alone kept it in operation. Meanwhile its controlling depth gradually diminished to five feet. In time growing usage by pleasure boats helped keep the canal open. Yachtsmen taking this route found it a comfortable day's run from Norfolk to Elizabeth City on the Pasquotank River, where they could get supplies and lay over for the night. On the Albemarle and Chesapeake Canal route such accommodations are not readily available.

From the beginning of the Norfolk to Beaufort waterway project, the Lake Drummond Canal and Water Company tried to persuade the government to take over its canal as well as the Chesapeake and Albemarle. In 1925 Congress finally agreed to buy it as an adjunct to the inland waterway for $500,000. After several years' delay the transfer of title took place on 30 March 1929. Until recently the Corps of Engineers maintained the canal at project dimensions of 9 feet deep over a bottom width of 50 feet and, under the project of 1899, maintained its approaches at 10 feet deep and 80 to 100 feet wide. In 1940-1941 the Corps replaced the canal's old timber locks with steel and concrete chambers 300 feet long and 50 feet wide. Although yachts en

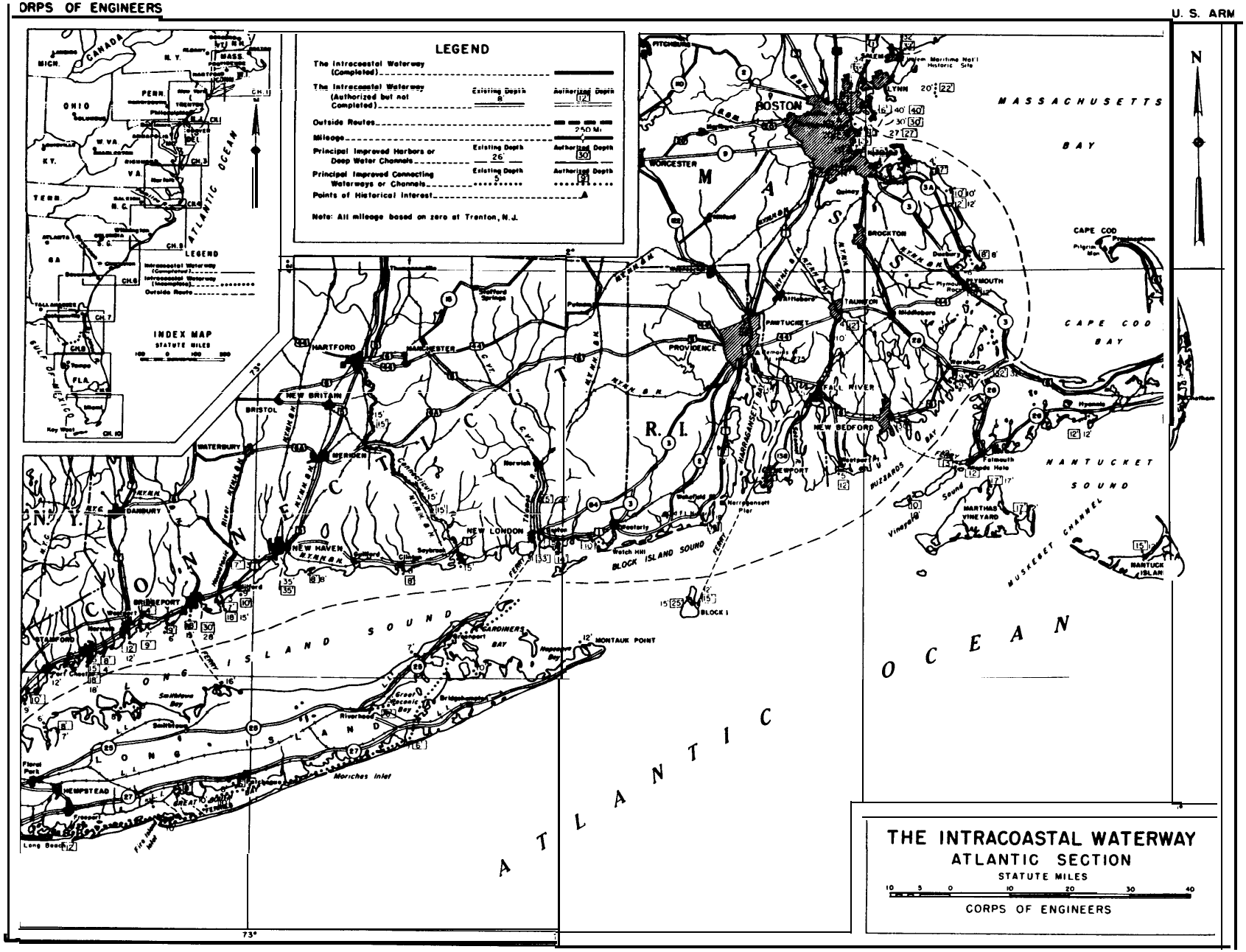
route to and from Florida continue to use the canal extensively, commercial traffic from 1974 to 1978 averaged only 173,504 tons annually. Finding this insufficient to justify maintaining the project depth, the Corps currently provides a 6-foot channel.[31]

The Cape Cod Canal

In 1860 the state of Massachusetts revived the idea, which had lain dormant since the 1820s, of cutting a canal through Cape Cod between Barnstable Bay and Buzzards Bay. It commissioned the drafting of new plans and in 1870 granted a construction charter to a newly organized Cape Cod Ship Canal Company. The state also asked the federal government to construct a breakwater to shelter the Barnstable Bay entrance, claiming that the work would be comparable to any other federal harbor project. Directed to look into the matter, Boston District Engineer Lieutenant Colonel John Foster suggested a much larger waterway than had been planned. A canal 23 feet deep, 300 feet wide at the surface, and 198 feet wide at the bottom, he advised, would permit the heaviest vessels of the Navy to pass through and allow vessels of all classes to pass each other. Because of considerable differences in the heights and times of tide at the two bays, previous plans had included locks at each end of the canal. Foster discarded this idea. He calculated that in a canal of the dimensions he proposed, the swiftest currents generated by tides, which would last only a few minutes anyway, would be no greater than in several other waterways navigated without difficulty.[32]

Foster's report established the concept of an open canal, but had no further effect as the canal company never started construction. For more than three decades new petitioners scrambled for charters to construct the canal. Several charters were granted, but little was accomplished. Almost everyone saw rosy prospects for the canal, but practically no one was willing to risk his own money. The string of false starts ended in 1907 when August Belmont, a New York investment banker and the builder of the city's first subway system, bought the rights and properties of a company chartered eight years before. Belmont formed a syndicate to underwrite the canal and in June 1909 started construction.[33]

Shortly afterward the Corps of Engineers made their intracoastal waterway surveys from Boston to Key West. They surveyed two inland routes from Boston to Narragansett Bay and also considered the advisability of purchasing the partly completed Cape Cod Canal, which would mean outside navigation for the waterway from Boston to Fishers Sound except for the several miles of the canal and Buzzards Bay. As existing commercial needs were insufficient to justify construction of a canal over either of the inland routes, the Corps recommended



Boston to New York City

postponing their further consideration until other sections of the proposed intracoastal waterway had been constructed and the benefit to commerce afforded by the Cape Cod Canal had been demonstrated. Accordingly, plans for purchasing the canal should also be delayed. Between Narragansett Bay and Long Island Sound the Corps surveyed a series of tidal streams, ponds, and lagoons that offered an inside route for a canal, but the Engineers doubted that it would be used sufficiently to warrant the large expense. The rest of the waterway to New York Bay, they noted, was by nature sheltered through Long Island Sound and of ample capacity for all the traffic that would ever use it except at its western end, where obstructions were already being removed.[34]

In July 1914 the Cape Cod Canal opened to traffic. It was a narrower waterway than Colonel Foster had proposed, Although its charter depth was 25 feet, its bottom width of only 100 feet and surface width of 200 feet precluded two-way traffic. The land cut of the canal was 7.68 miles long, a dredged approach in Buzzards Bay about 5 miles long, and the Barnstable Bay approach about one-half mile long, making the total length of the passage about 13 miles. For years it had been believed that the canal, by eliminating the hazardous passage around the cape, would aid shipping immensely. Yet it failed to attract the expected traffic. The current was a major deterrent. Underpowered vessels had to await slackwater or a favoring tide. Tugs towing barges could not proceed against the current, and on going with it had to take them through one at a time. Accidents occurred~ giving the canal a bad reputation. Mariners complained about delays in transit through the single-track route, the narrowness of the channel, shoals caused by bank erosion, the hazards of passing through narrow draw bridges, and the prevalence of ground fog.[35]

As early as 1915, Belmont, who formerly had been indifferent to government aid or purchase, thought that the national government “ought to really acquire the canal.” The first step in this direction was taken May 1917, five weeks after the United States declared war on Germany, when Senator John Weeks of Massachusetts introduced a bill for its purchase. Slightly amended, the bill became part of the Rivers and Harbors Act of August 1917. The government and the canal company, however, came to loggerheads on the question of price, an issue that was further complicated by claims for compensation due each side arising from the government’s takeover and repair of the canal in the last months of the war. In 1919 the government instituted condemnation proceedings that eventually led to an out-of-court settlement signed on 29 July 1921 under which the government agreed to pay the canal company $5.5 million in cash and assume its $6 million bond obligation. Until Congress approved the contract and appropriated the money, the company would operate the canal and the government would be responsible for the interest on the bonds.

In the next half-dozen years seven bills to carry out the contract were introduced in Congress, only to fail because of haggling over the terms, indifference, or opposition. In January 1927 a bill finally passed, but only with a Senate amendment providing that the government should pay interest on the bonds from the date of the title transfer rather than from the date of the contract, which meant a loss of nearly $2 million to the canal company. After more delay because of questions arising over the validity of company land titles, the United States took over ownership of the canal on 30 March 1928.[36]

The Corps of Engineers made extensive repairs on the canal and the government abolished tolls. Commerce seeking the waterway increased from 894,763 tons in 1927 to nearly 2.5 million tons in 1930. But it was obvious that without major improvements the canal could never attract the great bulk of shipping compassing the cape. Studies authorized in 1930 recommended deepening and widening the channel, installing a tidal lock midway in the land cut to eliminate the problems caused by currents, and replacing the hazardous bridges with more suitable structures.[37]

Reconstruction began in 1933 as an emergency relief measure. The Public Works Administration allocated funds to construct three bridges and widen the land cut to 205 feet. Before work had progressed very far, plans for the project went back to the drawing board. An initial widening of the land cut in one place to 170 feet had resulted in greater current velocities, yet tugboat operators found that most of the difficulties for one-way traffic had been removed. The trouble with the canal had not been the current, but the narrow width of the channel. A locked canal was no longer viewed as necessary, and the winter of 1933-1934 showed that it might be a nuisance. Buzzards Bay became so choked with ice that shipping was disrupted for weeks at a time. But the canal did not freeze. It was apparent that in the still waters of a locked canal there could be serious trouble with ice formations every few years.

Boston District Engineer Colonel John J. Kingman proposed modifying the project to provide for an open waterway 32 feet deep and 540 feet wide through the land cut. The 540-foot width would not only insure safe two-way navigation but also permit the excavation of a channel 40 feet deep and 500 feet wide at some future time without impairing revetments and other works on the banks of the canal. Other recommendations included widening the channel approach in Buzzards Bay to 500 and 700 feet, constructing mooring basins at each end of the land cut, and installing a new lighting system to combat the problem of ground fog. The reviewing authorities of the Corps concurred with Kingman's proposals, and Congress authorized the project in August 1935.38

By 1940 the project was essentially completed. The Corps cut the surface width of the canal to about 700 feet but reduced the bottom width to 480 feet. More gradually sloping banks, the Engineers reasoned, would reduce erosion and provide greater safety if a ship ran aground. In addition to the mooring basins for freighters, the Corps constructed harbors of refuge for small craft at each end of the waterway. With extended approach channels reaching to the new 32-foot depth, the total length of the canal became 17.5 miles. Even while work was in progress the improved canal attracted new shipping. In 1940 three times as many ships and more than eight times as much cargo tonnage went through as had gone through the old canal in 1927, the last year of private ownership.

During World War II cargo tonnage doubled as convoys bound for Greenland, Iceland, and the United Kingdom assembled in Buzzards Bay and all but the deepest ships sailed through the protected passage. Other merchant ships, whose peacetime routes passed wide of the cape, sought the safety of the canal, and naval vessels of the lighter classes used it extensively. At the height of submarine activity in the Atlantic, as many as 80 merchantmen and warships used the canal in a single day. Nearly 19 million cargo tons passed through in the year 1944.

After the war the canal continued to attract heavy traffic. Since 1970 freighters and tankers have carried through an average of about 12.5 million cargo tons annually. Thousands of recreational craft also pass through the canal each year. To accommodate this traffic the Corps, between 1957 and 1963, provided additional anchorage facilities at each end of the waterway .39

THE INTRACOASTAL WATERWAY FROM BEAUFORT, NORTH CAROLINA, TO KEY WEST, FLORIDA

In 1913 the Corps of Engineers submitted its report on the Beaufort, North Carolina, to Key West, Florida, section of the proposed intracoastal waterway. The Engineers were divided in opinion. The special board of officers making the survey recommended a ten-foot-deep waterway for the entire distance of 925 miles, to be completed in six years at an estimated cost of $31 million. Brigadier General William H. Bixby, the Chief of Engineers, concurred on the need for an intracoastal waterway but saw no urgency for one ten feet deep or, in view of the sparse population on Florida's east coast, for construction through to Key West. He recommended, for the present, a seven-foot channel as far as the St. Johns River, which the special board formed at his request estimated would cost about $14.4 million. The Board of Engineers for Rivers and Harbors declined to endorse either recommendation. Through traffic would be

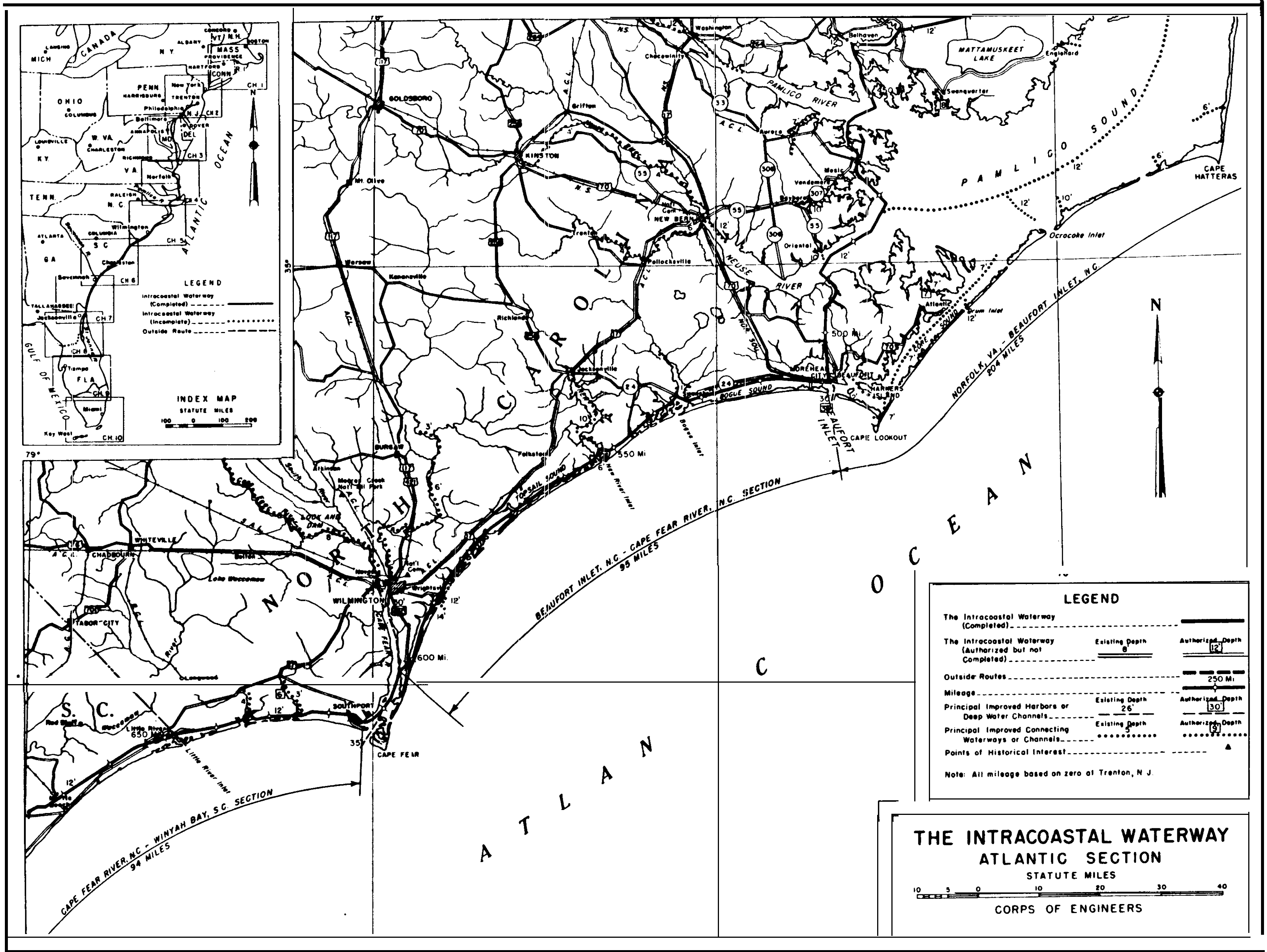
negligible, the board argued, as vessels suited to the waterway could not compete in capacity or speed with seagoing vessels. It agreed with the special board that most commerce would be local but saw no prospect of an increase sufficient to warrant the large expenditures involved. It noted that between Charleston and Jacksonville--in its view the most promising section of the intracoastal waterway--channels for small boat traffic already existed, for two of which improvement had already been recommended. Improvement of the remaining sections of the waterway, the board concluded, was not advisable at the present time.[40]

Congress took no action on the report. Ultimately the waterway between Beaufort, North Carolina, and Key West was developed, not as single project, but in several sections improved by stages in response to expectations of commercial benefit. The entire Intracoastal Waterway remained a string of variously named projects until 1947, when all but the last two of the southern reaches were collectively designated the *'Atlantic Intracoastal Waterway between Norfolk, Vs., and St. Johns River, Fla." The ship canals comprising the waterway in the north and the sections between the St. Johns River and Key West continue to remain separate projects.

Inland Waterway, Beaufort to Cape Fear River, North Carolina

The Intracoastal Waterway from Beaufort, North Carolina, to the Cape Fear River passes from Beaufort through Bogue Sound to Swansboro, thence through the sounds and marshes to the south to the lower end of Myrtle Sound where, near Carolina Beach, a land cut of 1.6 miles brings it into the Cape Fear River about 16 miles below Wilmington. Covering a distance of 93.5 miles, the channel is 12 feet deep at mean low water with bottom widths varying from 90 feet in land cuts to 300 feet in open waters.

Contrary to the assumption made by Secretary Gallatin when writing his report on roads and canals, inland navigation along this stretch of the coast even for vessels of light draft was not practicable. Between Beaufort and Swansboro the governing low-water depth through Bogue Sound was 18 inches; between Swansboro and the New River the depth of channels winding through marine marshes sometimes diminished to 6 inches; and between the New River and the southern end of Myrtle Sound the shallow channels and marshes were not navigable by rowboats at low water. Small boats sailing between Beaufort and the Cape Fear River had to make the trip by ocean and pass around the dangerous Cape Fear Shoals with no safe inlets to put into if caught in bad weather and without enough good daylight to make a safe through run.[41]



The Intracoastal Waterway: North Carolina

Navigation improvement along this reach of the inland waterway began in 1836 with a small appropriation for dredging in the New River, which today carries a side channel of the Intracoastal Waterway 21 miles to the town of Jacksonville. Several more minor appropriations through 1910 further improved the river. Navigation improvement between Beaufort and Swansboro began in 1886 and between Swansboro and the New River in 1890. In 1917 Congress consolidated the three works under the project, "Inland Waterway, Beaufort to Jacksonville, N.C.," which provided for a channel 100 feet wide and 3 feet deep at mean low water between Beaufort and Swansboro, thence 40 feet wide and 3 to 4 feet deep at mean high water to New River, thence 40 feet wide and 3 feet deep at mean low water to Jacksonville.[42]

Congress authorized the 12-foot channel through to the Cape Fear River in 1927, and the Corps completed the work five years later. Since then the Corps has increased the usefulness of the waterway for both commercial and pleasure craft by constructing ten channels, several with boat turning basins, to connect with ocean inlets or nearby communities.[43]

Intracoastal Waterway from Cape Fear River, North Carolina, to Winyah Bay, South Carolina

Passing down the Cape Fear River to Southport, near the river's mouth, the Intracoastal Waterway then follows the Elizabeth River to its headwaters, cuts 2.6 miles through high ground to the head of Davis Creek, descends the creek, and continues through coastal sounds and marshes to the Little River. Ascending the Little River to its headwaters, it cuts nearly 22 miles through land to the head of Socastee Creek, thence follows the creek and Waccamaw River to Winyah Bay to complete a distance of 94.5 miles.

Before construction began in 1930 inland navigation between the Cape Fear River and Winyah Bay had been totally impossible. The depth of water in the Elizabeth and Little rivers and in Socastee Creek diminished to nothing at their heads, and in other places shallow channels and marshes could not be traveled by rowboats at low water. Where the land cuts were made, elevations reached 30 and 32 feet. The only navigation work along the route had been dredging in the Waccamaw River, authorized in 1880, to clear shoals as far as the town of Conway.

The project initiated in 1930 provided for a waterway 8 feet deep and 75 feet wide, which was completed in 1936. The next year Congress approved a channel 12 feet deep with a bottom width of not less than 90 feet. Applying to the Intracoastal Waterway from the Cape Fear River to Savannah, this legislation was in accordance with a Corps review report that recommended

enlarging that portion of the waterway to the same dimensions as already existed north to Norfolk. In 1938 provision was made for the construction of a yacht basin at Southport. Both project modifications were completed in 1940.[44]

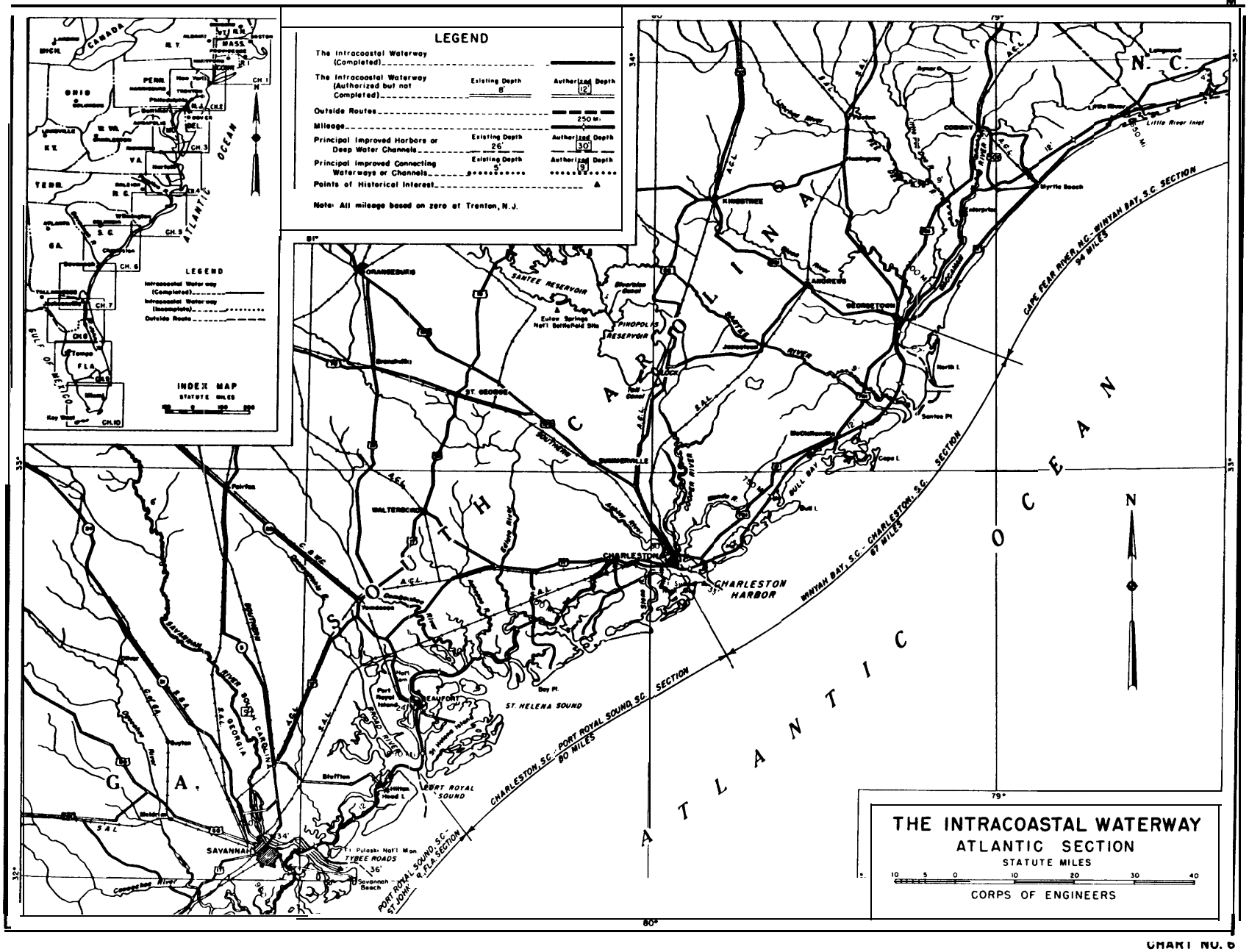
Waterway from Winyah Bay to Charleston, South Carolina

Leaving Winyah Bay 8 miles below the port of Georgetown, the Intracoastal Waterway passes through the Estherville-Minim Creek Canal to the North Santee River, cuts through Four Mile Creek to the South Santee River, and then threads through low coastal islands to Charleston Harbor, 63.5 miles away. For much of this course it follows a natural waterway, originally 86 miles long, that had allowed the passage of small vessels but was in many places obstructed by crooked channels and shallow reaches where low-water depths sometimes did not exceed a foot. More dangerous were stretches across Bulls Bay and near Cape Remain that were exposed to the sea.

Improvements on the waterway began in 1900 with the construction of the Estherville-Minim Creek Canal--6 feet deep, 70 feet wide, and 5 miles long--for the passage of Santee River steamers to Winyah Bay. A second project initiated in 1902 enlarged the channel from Charleston to the village of McClellanville, about two-thirds of the way to Winyah Bay, to 4 feet deep and 60 feet wide and rerouted it to eliminate the open stretch across Bulls Bay. 45 Nothing more was done until 1919, when the Corps extended these channel dimensions through to the Estherville-Minim Creek Carol along a course that avoided the exposed run near Cape Remain. In 1925 Congress authorized the cut across the Santee Delta at Four Mile Creek, which shortened the waterway by 10 miles. In 1932 the Corps recommended constructing a channel 10 feet deep and 90 feet wide, generally following the existing route. This project was included in the Public Works Program launched in 1933 to stimulate the economy, was adopted by Congress in 1935, and was completed the next year. In 1937 the legislation establishing uniform dimensions for the Intracoastal Waterway from the Cape Fear River to Savannah increased the project depth to 12 feet. Three years later this work was completed.[46]

Waterway from Charleston to Beaufort, South Carolina

At Charleston Harbor the Intracoastal Waterway passes from the Ashley River through the Wappoo Cut and continues along a sinuous string of tidal streams and land cuts 66.5 miles to the Beaufort River at Beaufort, South Carolina. Better endowed than the inland water course to the north, the original natural waterway between Charleston and Beaufort had a minimum depth of 6 feet interrupted at only four places and, except for a 6-mile passage across St. Helena Sound, was well protected from the sea.



The Intracoastal Waterway: South Carolina

Early work on the waterway tackled its most bothersome stretches. The first undertaking was at Wappoo Cut, a crooked and shallow creek joining the Ashley and Steno rivers. By dredging and by a cutoff bypassing some of the worst bends, a project authorized in 1881 created a channel through the cut 6 feet deep and 60 feet wide. At the other end of the waterway, a project adopted in 1890 improved Brickyard Creek. A continuation of the Beaufort River, Brickyard Creek had a fairly good 7-foot channel except near its juncture with the Coosaw River, where the channel practically disappeared among shoals. Work completed in 1905 provided the creek with a through 7-foot channel of '"convenient width." A third improvement, made in 1905-1906, was the construction of Fenwicks Island Cut in the central portion of the waterway. Replacing a narrow, tortuous, and shallow passage through Mosquito Creek, the cut, 7 feet deep and 90 feet wide, connected the South Edisto River with the Ashepoo River.

In 1925 Congress consolidated these improvements into a single project for a waterway from Charleston to Beaufort 7 feet deep and not less than 75 feet wide. Completed in 1929, the Corps ' work consisted mainly of widening and deepening the channel in Steno River, where in places the low-water depth had been 4 feet; constructing another cutoff at Wappoo Cut to eliminate a sharp curve; and cutting a new channel between the Dawho and South Edisto rivers to avoid more sharp bends and shorten the waterway by 9 miles. In 1931 a Corps report recommended eliminating the exposed passage across St. Helena Sound by excavating two short cuts through the marshes between the Ashepoo and Coosaw Rivers. This work, authorized under the Emergency Relief Appropriation Act of 1935 and included in a rivers and harbors act later in the year, was completed in 1936. In 1937 the Corps resumed construction on the entire waterway between Charleston and Beaufort to bring the channel to the 12-foot-deep, 90-foot-wide dimensions authorized that year for the Intracoastal Waterway from the Cape Fear River to Savannah. The Engineers completed this alteration in 1940.[47]

Waterway between Beaufort, South Carolina, and St. Johns River. Florida

Between Beaufort, South Carolina, and the St. Johns River the Intracoastal Waterway consists mostly of natural water courses through sounds and tidal marshes. Several artificial cuts help shorten the route and avoid exposed localities. Two hundred and seven miles long, this section offers intermediate connections with Port Royal, South Carolina; Savannah, Darien, and Brunswick> Georgia; and Fernandina, Florida. Even before improvement of the waterway, light-draft boats had carried considerable commerce between Beaufort and Savannah. Between Savannah and Fernandina, where the controlling depth of water was three feet, traffic had

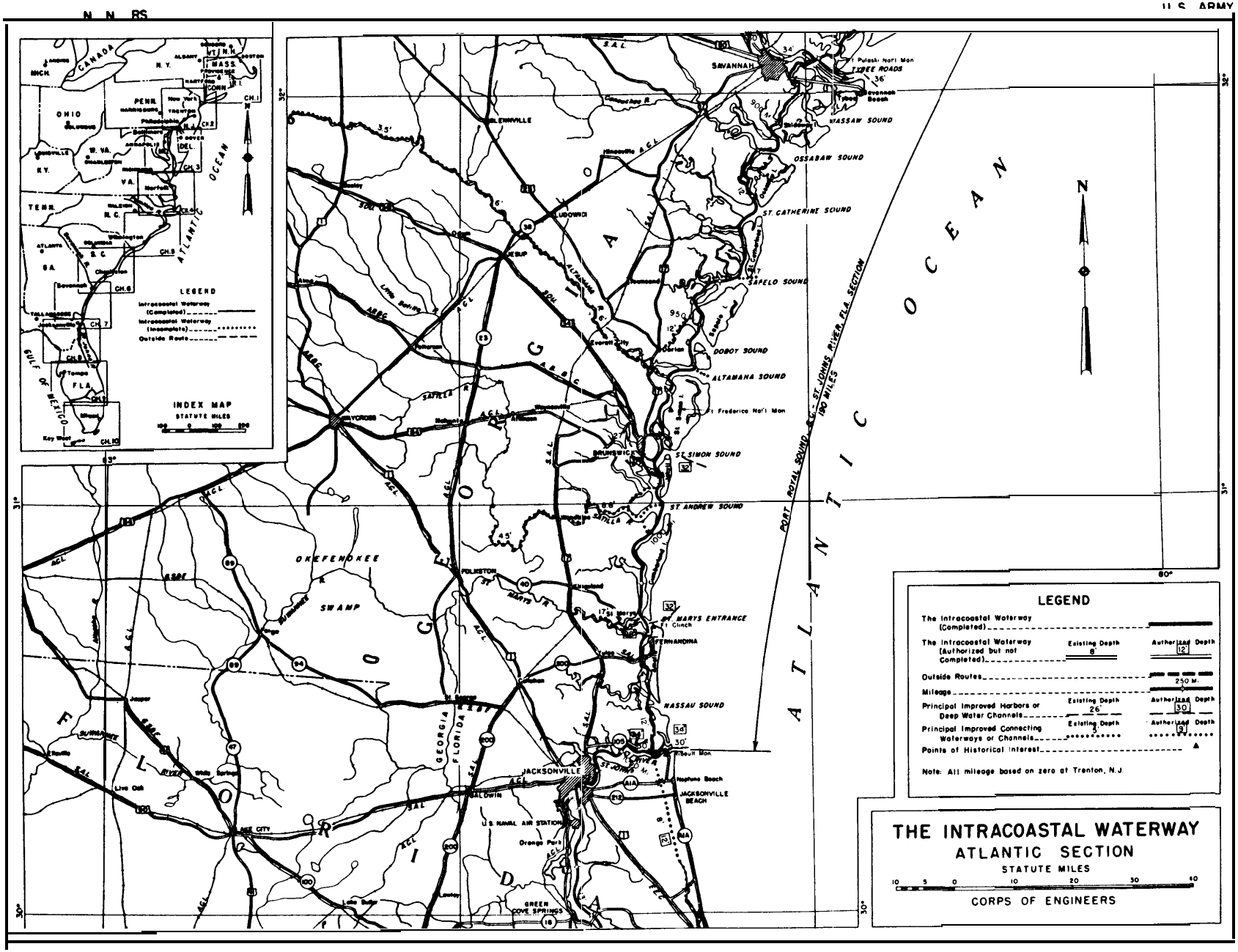
been lighter. Between Fernandina and the St. Johns River, which the waterway enters a few miles from its mouth, nature had neglected to provide a through channel, but private interests opened a shallow passage early in the nineteenth century by making cuts to connect streams paralleling the coast.

Until 1917 the Corps improved these three reaches of the waterway under separate authorizations. Work began on the section between Fernandina and the St. Johns River. Between 1828 and 1839 the Army Engineers dredged shoals at several places, chiefly in the cuts. Nothing more was done until 1874 when Congress called for dredging between the St. Johns River and Nassau Inlet in order to provide a better outlet for the commerce of the St. Johns than across the treacherous bar blocking the river's mouth. Six years later, however, upon the adoption of plans for improving the entrance of the St. Johns, the project was abandoned. The channel soon shoaled to 2.5 feet and remained in this condition until 1913. That year Congress authorized a new project, completed in 1915, to open a waterway between Fernandina and the St. Johns River 7 feet deep and 100 feet wide.[48]

Between Savannah and Fernandina the first navigation improvements deepened passages at Romerly Marsh in 1882 and at Jekyl Creek in 1888. In 1892 work began on a through 7-foot-deep channel. A separate project of 1905 improved Skidaway Narrows, a twisting and shallow passage near Savannah that was much used in preference to the regular route because it was safer in bad weather and shorter. In 1912 Congress incorporated the Narrows and four other water courses used as alternate routes or auxiliary channels into the Savannah to Fernandina Waterway.[49]

Work between Beaufort and Savannah began in 1896 with a project to deepen the natural waterway between the two communities to 7 feet throughout its course. Because current plans for improving Savannah Harbor included closing old entrances of the waterway, a new entrance was to be cut into the Savannah River near its mouth. Three years later, however, the waterway was re-routed to move the entrance upriver to a less exposed locality. In 1912 a similar change of route was made where the waterway entered Beaufort River to bring it into the shelter of Parris Island. Twenty-five years later this passage was abandoned in favor of the deeper water of Port Royal Sound.[50]

The Rivers and Harbors Act of 1917 consolidated the projects on the three reaches into the "Waterway between Beaufort, S.C., and St. Johns River, Fla." All work under the new authorization, which included several cuts that considerably shortened the



The Intracoastal Waterway: Savannah to Jacksonville

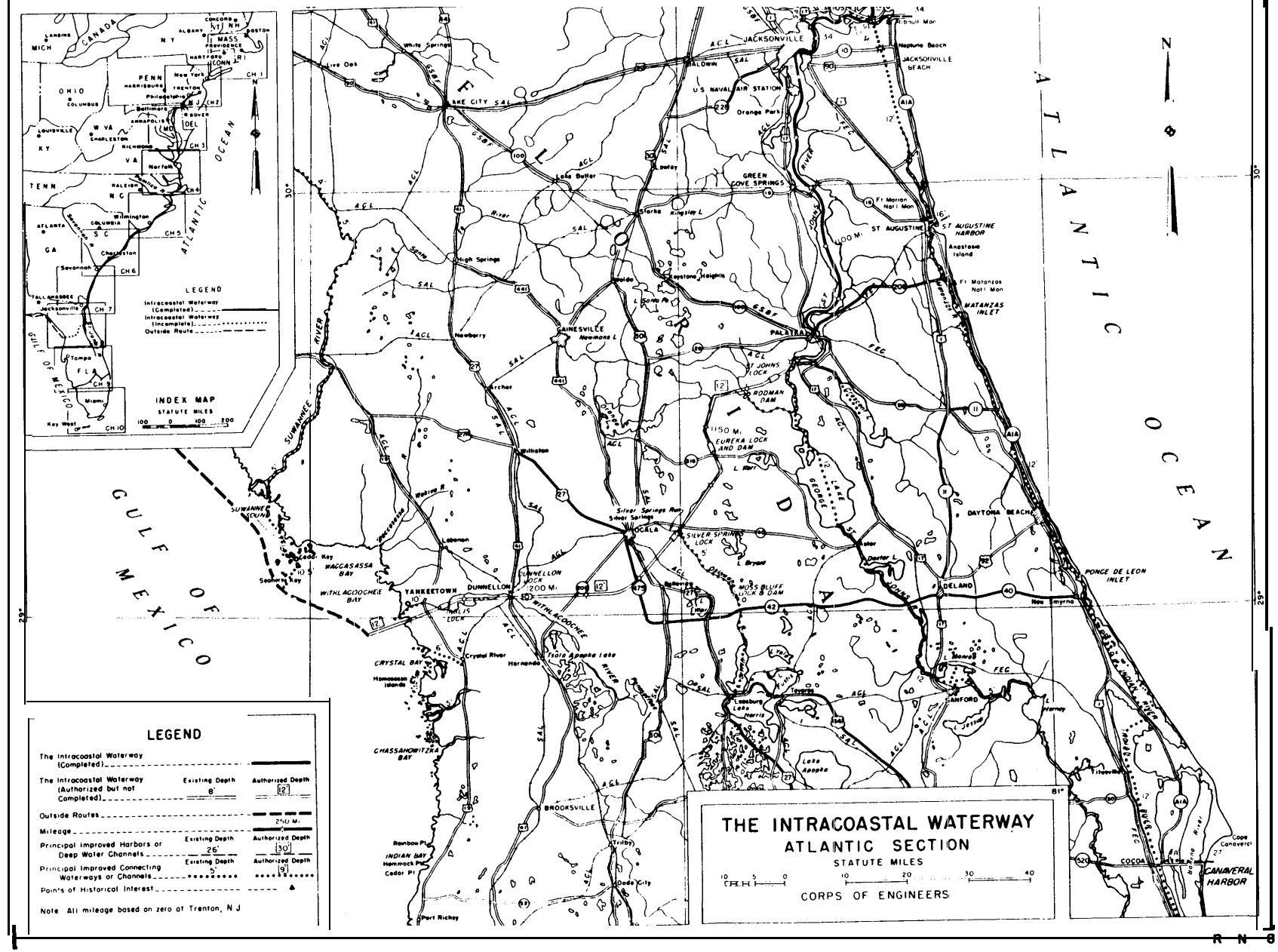
length of the waterway, was completed in 1932. In 1937 the waterway as far as Savannah came under the provision of that year for establishing a 12-foot-deep, 90-foot-wide channel from the Cape Fear River. The next year, upon the request of carriers, Congress authorized the extension of the 12-foot channel to the St. Johns River, work which the Corps completed in 1941. Between 1919 and 1945 Congress also provided for the construction of an anchorage basin at Thunderbolt, Georgia, and for the incorporation into the project of five more ancillary channels connecting with intermediate points or offering more protected passages.[51]

Intracoastal Waterway, Jacksonville to Miami, Florida

The Intracoastal Waterway from Jacksonville to Miami extends down the St. Johns River from Jacksonville to the entrance of Pablo Creek, a few miles from the river's mouth, and then follows an almost continuous series of protected waterways just inside the coast to Miami on Biscayne Bay for a total of 370 miles.

Early federal projects on this lengthy course were restricted to Indian River, a 128-mile-long lagoon lying between the mainland and barrier islands midway along the waterway. The first, prompted by logistic problems during the Second Seminole War of 1835-1842, was the construction in 1853-1854 of a small canal 8 feet wide, 2 feet deep, and less then half a mile long at a portage called the Haulover between Mosquito Lagoon and Indian River to permit the Army to transport supplies by flatboats down the waterways without having to lug them across an intervening sand barrier. With little permanent population in the region, the small passage soon fell into disrepair. By 1892, however, settlements along the Indian River had developed to the extent that a project was initiated for clearing a 5-foot-deep, 75-foot-wide channel for steamers through the river's most obstructed section between Goat Creek and Jupiter Inlet. Small dredging projects authorized in 1894 and 1896 opened Indian River Inlet and Jupiter Inlet for passage of small vessels to the sea.

The development of a continuous waterway along Florida's east coast was left to private enterprise. In 1883 the Florida Coast Line Canal & Transportation Company began construction from the St. Johns River to Biscayne Bay that continued until 1912, when the last section of the Florida East Coast Canal was completed. By charter requirements the company was to provide a channel 5 feet deep and 50 feet wide, but whether because of inadequate toll receipts or greater interest in profiting from the sale of lands granted by the state to subsidize construction, it failed to maintain these dimensions.



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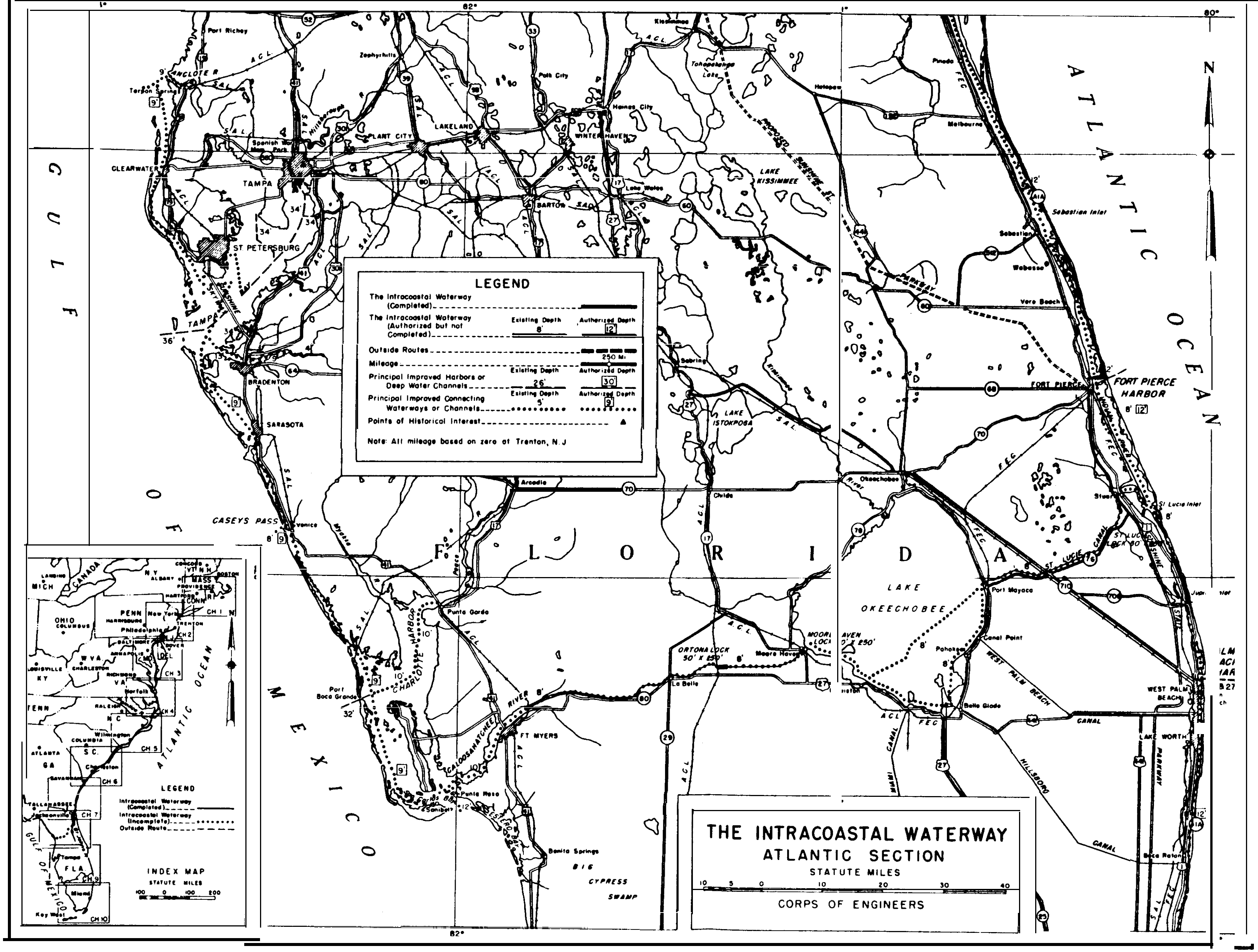
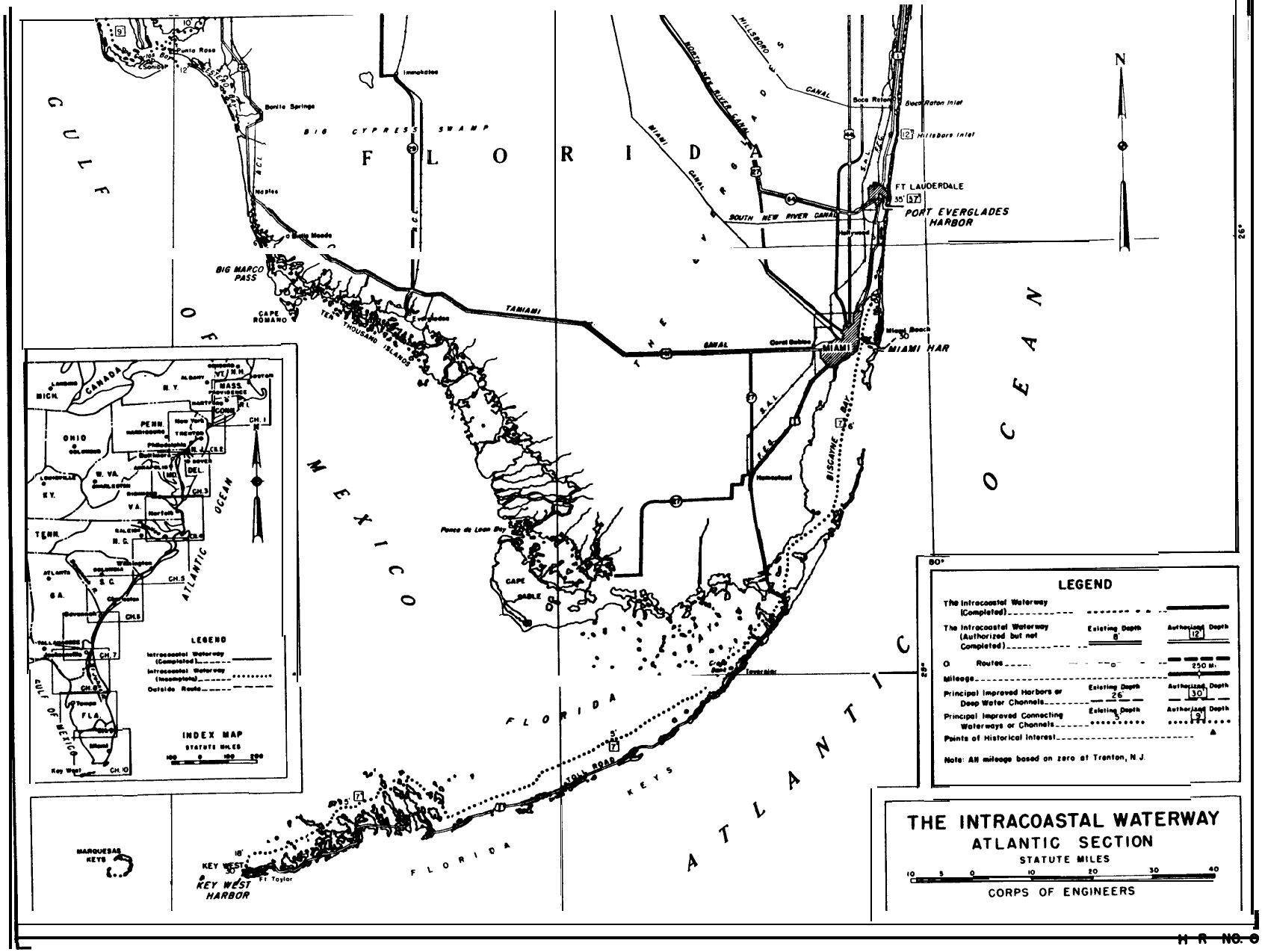
Intracoastal Waterway: Florida



Intracoastal Waterway: Florida



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Intracoastal Waterway: Florida

In 1915 Congress directed the Corps of Engineers to examine the advisability of purchasing the canal and converting it into a more usable waterway. The canal company was willing to sell its rights for $2 million, but the survey board advised against the purchase. Taking the same position as had the Chief of Engineers in relation to the intracoastal waterway surveys made a few years before, the board did not believe that commerce along Florida's still sparsely populated east coast would develop sufficiently within a reasonable period to justify the large expense. In 1920 Congress ordered a second survey. Not reporting until 1926, the Corps found a markedly changed situation. Noting that between 1920 and 1925 the population of Florida's east coast counties had increased more than 70 percent and that the Florida East Coast Railway could not provide adequately for the movement of perishable crops, the Corps now advised that the development of the waterway was warranted. It recommended the construction of an 8-foot-deep, 75-foot-wide channel (modified in 1930 to 100 feet wide) from Jacksonville to Miami, provided that local interests acquired the Florida East Coast Canal and the necessary rights of way and transferred them free of cost to the United States.[53]

Congress approved the project in 1927, and in 1929 a Florida Inland Navigation District created by the state purchased the canal properties and conveyed them to the United States. Financed in large part by Public Works funds, the construction of the waterway was completed in 1935. Ten years later, in response to objections by local interests that common carriers found it unprofitable to operate on regular schedules in an 8-foot channel, Congress authorized a channel 12 feet deep and 125 feet wide. In 1960, however, an economic study report led to a reduction of the project depth to 10 feet for the portion of the waterway between Fort Pierce and Miami. These channel modifications were completed in 1965. Extending through a now populous and recreationally popular coastal strip, the waterway from Jacksonville to Miami is dotted with private and municipal wharves and piers for freight and recreational craft, makes intermediate connection with the deep-water ports of Fort Pierce, Palm Beach, and Port Everglades, and connects with ten yacht basins open to the public.[54]

Intracoastal Waterway, Miami to Key West, Florida

In 1935 Congress authorized the continuation of the Intracoastal Waterway, with a channel 7 feet deep and 75 feet wide, from Biscayne Bay through Card, Barnes, and Backwater sounds into Florida Bay as far as Cross Bank at the southern end of Key Large, 63 miles from Miami and 94 miles short of Key West. A Corps survey report of 1932 justified the extension only to that point, where it would connect with Key Largo and

neighboring Plantation Key, the largest of the Florida Keys and the most important in fish and agricultural production. The survey found that the depth of water in Biscayne Bay and the sounds to the south was generally 10 to 12 feet and in the eastern end of Florida Bay 7 feet, but scattered shoals interrupted through navigation. Dredging through the shoals to construct a 7-foot channel to Cross Bank would cost relatively little. But the cost would be too great and the benefits too uncertain to justify extending the channel to Key West. For 53 miles from Cross Bank to Bahia Honda the controlling depth of water was 5 feet and for 41 miles from Bahia Honda to Key West only 2.5 feet, conditions that would require almost continuous dredging. The dredging to Cross Bank was accomplished in 1938-1939, with the width of the channel increased to 90 feet at no additional cost.

In 1945 Congress authorized the extension of the 7-foot channel to Key West. A Corps review report, completed in 1942, had advised that the channel would not only be of commercial benefit but would facilitate the activities of the federal military and civil agencies located at Key West. Funds for the work, however, never materialized. In 1963 an economic study report concluded that the extension was not economically justified, and this last stretch of the Intracoastal Waterway was placed in the inactive category. [55]

THE "MISSING LINK"

With the completion of the channel from Miami to Cross Bank in Florida Bay in 1939, the Intracoastal Waterway along the Atlantic coast reached its present length. But there is a "Missing Link," as it has been labeled by the Atlantic Deeper Waterways Association. The through navigation envisioned by Gallatin is interrupted between New York Bay and the Delaware River, where once the Delaware and Raritan Canal had carried more traffic than the famous Erie.

After 1872 the volume of coal entering the Delaware and Raritan Canal, which had comprised more than 80 percent of its tonnage, steadily declined. The Philadelphia and Reading Railroad, which now controlled many of the Schuylkill mines, preferred to ship anthracite to New York by rail or by barges towed along the outside route. The Pennsylvania Railroad, which in 1871 leased the canal to acquire affiliated railway rights across New Jersey, favored shipments by rail rather than canal and was apparently indifferent to the decline of traffic on its waterway. Despite criticism of the railroads by waterways advocates, the canal could in fact no longer accommodate barges of the size necessary for the economical transportation of freight by water. Freight revenues in the twentieth century

fell below those from pleasure craft. In 1933 the canal ceased operations, and the next year the railroad gave its rights to the waterway to the state.[56]

The failure of the Delaware and Raritan Canal to meet the requirements of modern water transportation caused the city of Philadelphia, in 1894, to commission an investigation of feasible ship canal routes across New Jersey. Reporting the next year, the commission favored a route from Bordentown to Sayreville near the mouth of the Raritan River, located to the south of the existing canal and following a more direct course across the state. Because of land elevations on the route ranging from 75 to 100 feet, it did not propose a sea-level canal, but one equipped with three locks at each end.

Philadelphia took no further action, and the scheme for a ship canal remained in abeyance until the Corps intracoastal waterway surveys initiated in 1909. Like the Philadelphia commission, the special board conducting the surveys ruled out the purchase of the Delaware and Raritan Canal. Topographical and geological conditions, the existence of numerous bridge crossings, and its route through the business center of Trenton were all too unfavorable for its conversion to a ship canal. The board recommended the construction of a 25-foot-deep sea-level canal close to the route proposed by the Philadelphia commission. It estimated the cost at $45 million and advised that construction should be deferred until the two sections of the waterway to the south were completed. Chief of Engineers Bixby, unconvinced of benefits to the general public sufficient to warrant that great an expense, recommended a 12-foot-deep locked canal at a cost of $20 million. It should be constructed to permit future enlargement, but as the benefits accruing from the use of heavy-draft boats would be mainly local, this cost should be met through provisions of local cooperation. The Board of Engineers for Rivers and Harbors advised against constructing either canal, but suggested that if one were built, the United States should foot only half the bill.[57]

Four more Corps reports on the New Jersey ship canal between 1920 and 1936 failed to produce a favorable recommendation. Prospective commercial benefits never caught up with escalating costs. By 1920 the estimated cost of a 12-foot-deep locked canal had risen to $40 million and that of a 25-foot-deep sea-level canal to $86 million. By 1930 the cost of a sea-level canal only 12 feet deep was $100 million. In 1934 a congressional request for data on a waterway with a minimum depth of 25 feet resulted in plans that discarded the concept of an open sea-level waterway and recommended a canal with a summit level of 10 feet reached by locks and dams in the Delaware and Raritan rivers. Studies had developed the essential requirement that the canal

must be designed to prevent an intolerable intrusion of salt water into the Delaware River, upon which Philadelphia and other communities were dependent for water supplies. The estimated cost of the waterway was $210 million.[58]

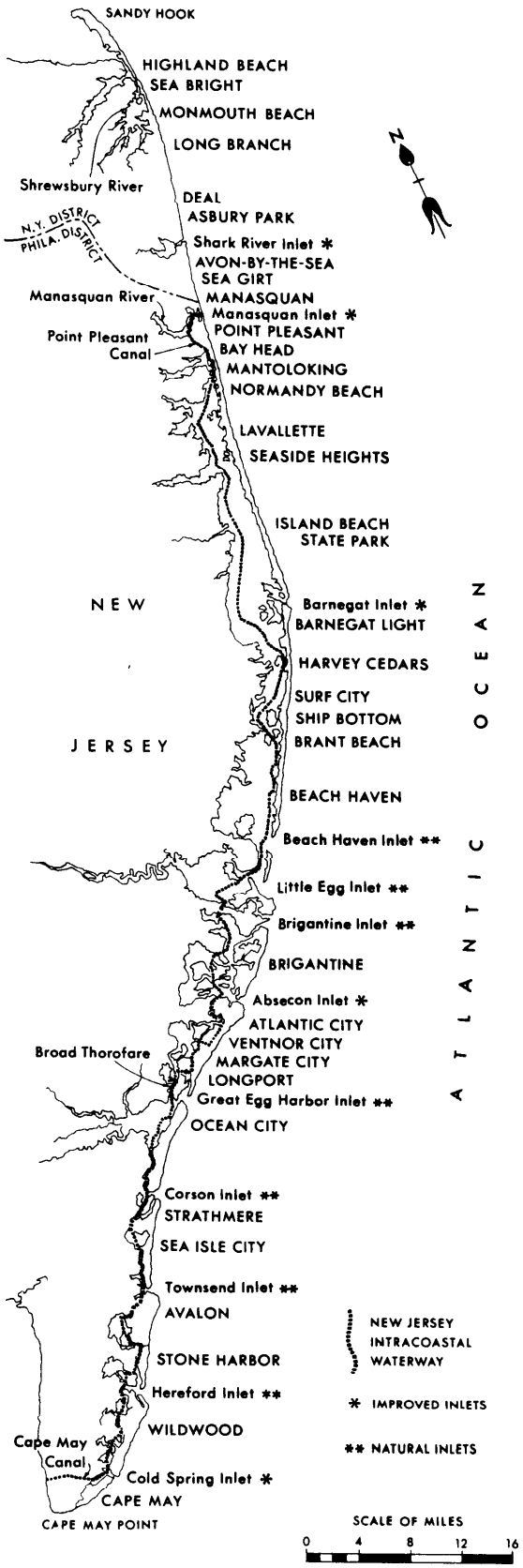
It took the submarine menace of World War II to draw from the Corps, in 1942, a favorable, though divided, review report. The Board of Engineers for Rivers and Harbors concluded that the value of a barge canal in time of war, together with prospective benefits in normal times, warranted the construction of a 14-foot-deep canal at an estimated cost of $145 million. Lieutenant General Eugene Reybold, the Chief of Engineers, believing that the war had demonstrated the value of a ship canal that could be built for only 29 percent more, recommended the construction of the 27-foot-deep locked canal for which plans had been drawn.[59] No further reports on the New Jersey ship canal have been completed, and the "Missing Link" in the Intracoastal Waterway is not likely soon to be forged. Changing concepts of war have lessened the military incentive for the canal, and the large problems of cost in relation to benefits and of salt water intrusion still remain.

The New Jersey Intracoastal Waterway

Lacking a route across New Jersey, light-draft boats may take a sheltered passage down most of the New Jersey coast and into the lower end of Delaware Bay by the New Jersey Intracoastal Waterway. Beginning at Manasquan Inlet, 26 miles south of Sandy Hook, the waterway passes through the 2-mile Point Pleasant Canal to the head of Barnegat Bay, follows a series of bays, lagoons, and thoroughfares inside the New Jersey barrier islands to Cape May Harbor, thence crosses the southern tip of the state by the 3-mile Cape May Canal to enter Delaware Bay about 3 miles above Cape May point. The state of New Jersey constructed the waterway from Manasquan Inlet to Cape May Harbor, a distance of 106 miles, between 1908 and 1918. Although the authorized dimensions were 100 feet wide and 6 feet deep, the state dredged portions of the channel to depths of 10 and 12 feet. The Corps of Engineers dredged the Cape May Canal, a cut 12 feet deep and 100 feet wide, with Navy Department funds in 1942 as an emergency wartime measure to facilitate transportation along the coast.

In 1945 Congress adopted the New Jersey Intracoastal Waterway as a federal project and authorized a through channel 12 feet deep and generally 100 feet wide. The rationale for the project was that it would bring substantial recreational and commercial benefits and that the waterway was an essential part of the intracoastal route from Boston to Miami. Funds for dredging the 12-foot channel from Manasquan River to Cape May Harbor, however, were not forthcoming, and that portion of the project was soon

The Intracoastal Waterway: New Jersey



U.S. Army Corps of Engineers

deferred for restudy. The Corps maintains portions of the channel north of Cape May Harbor at the 10- and 12-foot depths originally dredged by the state, but elsewhere the controlling depth of the waterway is about 3 feet. Commercial traffic on the waterway, consisting in 1979 of 87,012 tons of fish and shellfish, is of minor importance.[60]

CONCLUSION

Two centuries of navigation development on the Atlantic seaboard has seen river improvement and canal construction to provide inland transportation, harbor improvement to serve foreign and coastwise commerce, and the construction of an intracoastal waterway to offer a sheltered passage the length of the coast. Influenced by changing commercial needs and political climates, this development has followed an uneven course.

During the colonial era the difficulty and often prohibitive cost of land transportation forced Americans to depend on waterways for travel and trade. Local authorities sometimes attempted navigation improvements, but the known instances are few. Atlantic harbors were deep enough in their natural states for the small ships of the time and mostly well sheltered. Numerous rivers were navigable by sloops for long distances inland, and above the head of sloop navigation shallow-draft boats could reach most communities.

American independence brought a need for better inland water communications. The interruption of coastwise shipping during the Revolution revealed the inadequacy of transportation facilities north and south along the seaboard. A surge of population westward to the Appalachians and beyond created a demand for better east-west connections. Soon the economic life of the nation quickened everywhere. Turnpike construction begun shortly after the Revolution greatly improved overland travel, but as goods still moved far more cheaply by water than by land, Americans continued to depend wherever possible on water routes. Private companies and state agencies set out as early as 1784 to improve river navigation, largely by constructing locks and canals at falls. Extensive construction of longer overland canals did not get under way until the 1820s, after the builders of the Erie Canal demonstrated that such huge undertakings were technologically and economically feasible. The river improvements frequently failed to bring significant results, but the dozen and a half major canals built along the seaboard helped greatly to fulfill transportation requirements of the age. Within a few decades, however, competition from railroads, which revolutionized land transportation, brought canal building to an end.

Albert Gallatin and other statesmen of broad national vision hoped to combine the many early nineteenth-century schemes for canals and roads into a coherent national system under the sponsorship of the federal government. But their plans met with only partial success. State and sectional jealousies, constitutional scruples, and partisan politics stood in the way of effective federal action. Federal appropriations helped build specific roads and canals, and the Army Corps of Engineers assisted in planning many internal improvements. But the transportation system in America was mostly shaped by the narrower interests of state governments and private enterprise.

The federal government did assume responsibility for river and harbor improvement. Work of a significant nature, performed by the Army Engineers, began in 1824 in response to greatly increased shipping activity. But the federal endeavors were fitful and of uncertain future for several decades. The political forces that obstructed federal development of roads and canals also impeded systematic navigation improvement. After the Civil War, however, a constantly growing volume of waterborne commerce carried in increasingly larger ships and a new political climate in the nation assured a strong federal role in river and harbor development. As an unprecedented program of navigation work continued to expand until about 1914, the Corps of Engineers improved almost every river and harbor on the East Coast that was expected to provide commercial benefits justifying the cost. Work then sharply declined for a decade-and-a-half and centered mainly on waterways of major commercial importance. In the 1930s public works spending and larger regular appropriations, which nearly doubled navigation work on the East Coast, restored a broader program. Interrupted by World War 11 and the Korean War, river and harbor improvement on the eastern seaboard resumed on a significant scale in 1956 and then gradually diminished. In 1980 the Corps of Engineers did not initiate a single new navigation project from Maine to Florida. By this time, however, they had deepened major Atlantic ports to 35 to 45 feet to accommodate deep-draft oil tankers and other large vessels. They had also improved numerous smaller ports important to the coastwise trade and harbors important to fishing fleets and recreational craft.

The Atlantic Intracoastal Waterway, conceived by Albert Gallatin in 1808, was not essentially completed until the 1930s. It is a hybrid creation comprised of two widely separated ship canals north of Norfolk, Virginia, and a string of barge canals south of that port. Although Gallatin and other advocates had in mind the advantages of a through route, the waterway came into being through a series of local projects developed in expectation of local benefits. Long-distance shipments along the seaboard are cheaper and quicker by large

coastwise vessels than by vessels suited to the restricted channels south of Norfolk. Commerce through the ship canals consists mostly of coastwise and foreign traffic en route to northern and Middle Atlantic ports. Commerce south of Norfolk is entirely domestic and mostly short haul, tributary to the nearest commercial centers and seaports. Although not a thoroughfare over which the goods of the North and South are exchanged, as envisioned by early planners, the waterway nevertheless carries large amounts of freight and is heavily used by recreational vessels.